DEPARTMENT OF NURSING EDUCATION

IN CHARGE OF

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TEACHING ANATOMY AND PHYSIOLOGY TO STUDENT NURSES

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In planning a course in Anatomy and Physiology for students in a School of Nursing, several points must be considered: (1) The number of hours available. (2) The general educational background of the group, which will influence one's choice of material. (3) The facilities for laboratory work.

On the basis of 60 hours, which is the time given to the course in the four schools in New York in which I am teaching, we give 30 hours to lecture, in which new material is presented to the students and important points are emphasized before the lesson is studied; and 30 hours to demonstration, laboratory work and oral quiz. Short written quizzes are given at intervals outside of class, and these grades, together with recitations, final examinations and note books, make up the average for the semester's work.

There is room for much difference of opinion as to the method of approach in the study of Anatomy and Physiology, since it is to many students an entirely new subject. We begin by giving a brief historical outline which stimulates interest, discussing first the primitive ideas of the body and cause of disease, then the work of Hippocrates and Galen and the reasons for the long, dark period up to the time of Luther, during which time no research work or anatomical study was allowed. Among others we speak of Eustachius and Fallopius, Vesalius and Huxley, and also Schleiden and Schwann, both of whom developed the cell theory, one in his work with plants, and the other with animals. Virchow's name is familiar to them if they are beginning the study of bacteriology and the work of Charles Darwin leads up to the theory of evolution, and what the evidences are which have made the theory accepted by all scientists.

The best reference book for the historical part is Andrew Dickson White's *Warfare of Science with Theology*, and it should be in every school library. *Applied Biology*, by Dr. Bigelow, gives a chapter on Evolution and we also use Osborne's *Men of the Old Stone Age*, and Crampton's *Theory of Evolution* as reference books.

The logical method seems to be to study the cell as the unit of structure, next, and gradually build up the intricate mechanism, the human body. If the schedule can be so arranged, it is well to give

chemistry first, then the students will be familiar with the chemical substances which make up the protoplasm of the cell. Their faces always brighten when some point in a new course is tied up with something they already know, and a certain amount of overlapping in subjects is an advantage, since it serves to correlate the material, and fix it in their minds. The functions of the cell are explained, how movement is produced, how the cell takes in food and gives off waste material and how it reproduces itself. It can be shown that every living thing manifests itself through eight biological systems, be it a one-celled animal like the amoeba, or a complex animal like man, and a comparison is made at this point between the biological systems of the amoeba and of man, one so simple, and the other so complicated in all its workings.

The laboratory work for this part consists of a study of the onion cell, which can be stained to show its parts. Plasmolysis is also taught at this point. Elodea, a water plant which can be bought at any fish and bird shop, shows best the movement of protoplasm, as it carries the chlorophyll bodies with it. This is studied under ordinary high power (500 X). Mitosis is briefly explained by charts, and is then taken up again when the reproductive system is studied, since by that time, the students have more background and it means more to them. Piersol's *Normal Histology* is used, principally for its illustrations, in connection with the microscopic work.

This leads up to the embryonic origin of tissue, and the formation of the ectoderm, mesoderm and endoderm, with the structures which come from each one of these layers of the blastoderm. This, too, is taken in more detail with the reproductive system. Next comes the study of the elementary tissues of the body, epithelial, connective, muscular and nervous. The laboratory work for the study of epithelium consists of an examination of squamous cells from the inside of the lower lip. The students prepare the slides, stain them and examine them, and make drawings in the note-books. Permanent slides of columnar and ciliated epithelium are shown and also a bit of the epidermis of the frog under high power. The gill of the live oyster or the clam shows the movement of ciliated epithelium when mounted in some of the sea-water from the shell. The different kinds of connective tissue can be illustrated by meat obtained from the butcher, and one can always get an umbilical cord from the obstetrical ward to show the jelly-like tissue, Wharton's jelly. Charts are prepared by the students showing the general characteristics of each variety of connective tissue with its location in the body. Long bones are cut by the butcher, showing longitudinal and transverse sections. A chicken bone is treated with dilute hydrochloric acid to remove the

inorganic salts, and another is burned to remove the organic matter. Glandular tissue and special membranes are studied next. Charts are made to show the structure of glands, and these are carefully reviewed when the lesson is given on ductless glands.

We come now to the eight biological systems, which may be taken up in any order which the individual instructor finds best. We take the skeletal system first, in the study of which the human skeleton is used. It is valuable, too, to have a bag of odd bones, which are spread out on the laboratory table, to be identified and described by the students in an oral quiz. When this system has been completed, they transfer to their note books an outline of the skeleton and are given fifteen or twenty minutes in the laboratory period, to fill in the names of all bones, classifying them at the side of the page, giving the number of each and arriving at the correct total.

It is valuable at this point to make an excursion to the Museum of Natural History, where the students are taken first to the Darwin Room and there trace the evolutionary stages from the first alcove containing the protozoa, up to the last containing the mammals and primates. Next we go to the paleontology laboratory, where they see the workmen painstakingly removing and identifying the bones of the fossil remains sent to the Museum from different parts of the country. They are able to see how these bones of animals which lived 500,000 to 2,000,000 years ago resemble in shape and position the bones of the human body.

The muscular system is studied next, beginning with the classification and chemical characteristics of muscle tissue, and drawings are made from permanent slides of different kinds of muscle tissue. Frogs are dissected, using one frog for every two students, to show muscle tissue, and also the general position of the organs of the body. Bigelow's *Applied Biology* has very simple and concise directions for the laboratory work with labelled drawings. Assignments for reading are given from Josephine Goldmark's *Fatigue and Efficiency,* that they may see the practical application and correlate the theoretical study of muscle fatigue with the work which is being done to shorten hours of labor, and provide change and recreation for those who are doing monotonous work, involving one set of muscles. If the apparatus is available, muscle fatigue may be demonstrated by tracings on the smoked drum, stimulating the gastrocnemius muscle of the frog in this experiment. A little pamphlet of colored plates showing the attachment of muscles and what happens when certain bones are fractured, is put out by a drug firm in St. Louis as an advertisement for its medicines. These illustrations we cut out and paste on tag-board charts and they are hung in the class room so that the students may

consult them as they study the different important muscles in the body and their action.

Next we study the circulatory system. In the laboratory periods, the students make a microscopic examination of a drop of their own blood, examine slides to show varieties of colorless corpuscles, and dissect sheep hearts. They also make slides showing the effect of isotonic, hypertonic and hypotonic solutions of salt on the red blood cells. The sphygmomanometer is demonstrated and they are told how the red blood count is made. Each student makes out a chart showing the composition of the blood and the origin, function and fate of the cells. The new book by Jean Broadhurst, called *Home and Community Hygiene,* is invaluable here, giving as it does a clear explanation of body reactions, the work done by the white corpuscles, how anti-bodies are formed and how they act. The fact that 3,000 copies were sold in the first eight months, shows how it has been appreciated by students and instructors of physiology and bacteriology as well as of hygiene and municipal sanitation. Each student also prepares charts of the pulmonary and systemic circulation, labelling the principal arteries and veins.

At this point we take up the nervous system, since it is required for an understanding of what is to follow. Home-made charts of the neurone and the areas of the brain and the spinal cord are shown as the new material is being presented. The human brain is used to point out the lobes, the ventricles, the pituitary gland and the circle of Willis; and a decapitated frog is used to demonstrate reflex action by stimulating the nerves artificially, and producing reactions in the muscles to which those fibers lead. The comparatively simple structure of the brain and spinal cord of the frog helps the student to understand how changes have come about in the process of evolution.

The next system taken up is the respiratory, the haslet of the sheep being used for the laboratory work. Frog's lungs are also inflated to show the lungs in a simple form.

After this we discuss the ductless glands and illustrate the effect of over and under secretion by a set of photographs of patients with the various disorders of the ductless glands.

The digestive system is discussed next, and the students make out a full-page diagram of the alimentary canal, filling in the names of the parts, the secretion given by each, enzymes contained in each, the kind of food acted upon, the end products of digestion and the place of absorption. Slides are shown of all the different parts of the alimentary canal itself and also the accessory organs, and drawings of these are made in the note books. The accessory organs of digestion are studied and the portal circulation is given here since it

has been found that the students grasp it better than when it is given with the circulatory system. A chart of the portal circulation helps also to make this part clear. Since the time given to chemistry is rarely more than 20 hours, I have planned to give the entire time next year to the inorganic part, giving the experiments in organic chemistry here, to show the chemical factors of digestion. These include experiments to show the action on food materials of the various digestive fluids, and also the dialyzing power of different carbohydrates and proteins before and after digestion. Some of these experiments are given in Bigelow's *Applied Biology*. We use dialyzing bags for these experiments, and the Windsor bean to illustrate dialysis and osmosis. This bean is soaked in water, the outer coat is carefully removed and tied over the end of a glass tube, molasses is put in the tube, which is then suspended in a beaker of water. If preferred, a carrot may be used, but this is more difficult to prepare.

In studying the Excretory System next, we use sheep kidneys for dissection. Slides of kidney tissue are shown and drawings are made of the uriniferous tubule. The skin is discussed next and since its main functions are protection and heat regulation, the body temperature with its regulation is studied here, and we also discuss the skin as a sense organ, and correlate the structure of the skin with the procedures on the wards, hydrotherapy, counter-irritants and so on. Slides are shown of the skin and drawings are made.

Next we take up the reproductive system, both male and female, and as illustrative material I have a set of blue prints, illustrating every part of the anatomy and relative position of the organs, as well as the development of the embryo. A human fetus of six weeks and some embryo mice, providentially procured at the psychological moment, have added to the interest of this part of the work.

We leave the special senses until this time, though they may be given directly after the nervous system. Beef eyes are used for dissection and the students always show great interest in this laboratory period. An enlarged model of the ear is used as well as a most beautifully mounted specimen of the temporal bone, a part of which is hinged, so that it can be opened to show the semi-circular canals and the cochlea.

During the entire course, a few minutes at the beginning of the lecture period are spent in review, simply to gather up the threads of the last lesson, and to prepare the students for the new work. No material is ever assigned for study before it has been presented in class, which lessens the danger of wrong impressions and helps the student to classify her facts according to their relative importance. At the beginning of the course, each student is given a mimeographed

copy of the outline of the course. In this each lesson is outlined briefly, with sub-headings, and all reference readings with pages are indicated. The outline of the laboratory work which follows each lesson is also given. This saves the students' eyes and time, which otherwise would be spent in copying assignments. These outlines are cut and pasted in the No. 6 loose-leaf note book. A list of leading questions is also mimeographed, covering the main points of each lesson, and this is pasted in the note book. Names of reference books in the school library, with pages indicated where answers may be found, are given after each question. Of course all this means an enormous amount of work for the instructor in the first place, but it does pay, and the note books are of some value to the student when she finishes the course. It has been found that the students do far better work if an intensive course is given, so in the schools in which they are off the wards during the first few weeks of the preliminary course, we give six hours a week in three two-hour periods, covering the course in ten weeks. The pathological side is constantly being seen on the wards, so the students are quick to correlate the practical work with the class room theory. There is an opportunity in the hospital to show pathological specimens and everywhere I go I find that spirit of coöperation and helpfulness, and a willingness to provide material and help, make the work a success. It is certainly the most interesting subject which the students have, and is the basis of all their practical procedures, so it is gratifying to see their interest grow. The suggestion was made by an instructor the other day, that we might make physiology more vital by giving a short simple course in the first year, to be followed the second year by a more detailed course when the students have the background of ward work. That might be carried out if the schedule were not already so heavy, but now it seems wiser to put most of the basic sciences early in the preliminary course, emphasizing the fact that this is only a beginning and that the students individually may add to their knowledge if they cultivate an inquiring attitude of mind.

We use the 5th Edition of Kimber and Gray, *Anatomy and Physiology for Nurses,* as a text book, and references are assigned from other books which we have in the library of each school. Among the most important books, not already mentioned, are Howell, *Text Book on Physiology;* Halliburton, *Hand-book of Physiology;* Dawson, *Anatomy and Physiology for Nurses;* Emerson, *Essentials of Medicine;* Huxley-Lee, *Lessons in Elementary Physiology,* which is especially good for digestion, the eye and the ear; Sherman, *Chemistry of Food and Nutrition;* Harrower, *Practical Hormone Therapy;* Stiles, *Nutritional Physiology.*